Appendix E:
Soils Report

US Soils

SOILS REPORT

9193 Black Star Canyon Road

Silverado, CA.

CHARLES H. HARTSOG

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REGISTERED STRUCTURAL ENGINEER
REGISTERED GEOTECHNICAL ENGINEER
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On Tuesday Morning, March 22, 2011

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Project Engineer
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RE: Soils And Geotechnical Report For Proposed New Towers At Oak Flat, 9193 Black Star Canyon Road, Silverado, CA 92676 (APN 085-621-02, 085-621-06, 085-921-09.

GENERAL - PROPOSED DEVELOPMENT

This is a report for building new radio towers and an equipment locker to replace the previous radio towers that have been removed. My services are only for these improvements. We have not performed any environmental services. Fill is not proposed. The term site refers to the proposed location and not to the entire parcel.

SITE CONDITIONS

The parcel is in the Santa Ana Mountains near the dividing line of Riverside to Orange County and includes a location commonly known as "Oak Flat". The intersection of Black Star Canyon Road, Skyline Drive, and Leonard Road (aka North Main Divide), is reportedly within the parcel boundaries. There is an existing structure on the parcel (reportedly built in the 1970's, Larry Booth) that is proposed to be demolished. The location of a septic system for this structure (if any) is not a known. There has been grading including with the placement of fill which was apparently compacted although the specifics are not known. Nevertheless, drilled piers are proposed for support.

The small valley forms a natural drainage swale that trends to the southwest with a concrete lined V ditch. The site is

not within the delineated liquefaction or slope hazard zones of the CGS Seismic Hazards Maps. The CGS Geology Map Of Santa Ana Quad, USGS OF 2006-1217, USGS 99-172, CGS 91-17, etc, delineate the materials may include Klhs, Klbc, Jbc, Tsi, etc. ? (Ladd Formation, Holtz, Baker Canyon, etc. ?). Borings and outcrops indicate a horizon of Sandy CLAY top soils over Siltstone BEDROCK which may conflict with some documentation. Significant desiccation is not observed. The materials observed are not of high plasticity or activity, indicating they are not highly expansive. The top soils in the valley may be creeping. Nevertheless, drilled piers are proposed. Vegetation consists of grasses, chaparral, etc. A copy of the previous report performed in 1989 is attached to this report. That report was for constructing the previous towers which have now been removed.

Liquefaction is not likely (Bedrock: N > 50+ bpf). There are not any known active faults through the site. The proximity of the area faults does indicate that strong seismic ground motion is likely during the life of the structure. Yet, reported earthquake performance in San Francisco during the 8.3 magnitude earthquake in 1906 with at least 52 major buildings up to 19 stories within 10 miles of the causative fault was:

> "No class A building founded on well driven piles or well placed concrete (drilled) piers suffered any material injury due to the (1906) earthquake" (Subsidence and The Foundation Problem In San Francisco, American Society of Civil Engineers 1932).
>
> "Buildings known to have foundations of a type adequate to prevent significant differential settlement .. had no foundation damage" (Weigel, Earthquake Engineering, page 179).

Other experience has demonstrated that structures can be designed and built to resist extremely intense ground motion and remain undamaged (Earthquake Engineering Research Institute, 1979 convention, Krishna; the undamaged structures in the epicenter region of an 8.7 magnitude earthquake). According to Krishna, damage is mostly attributable to poor detailing rather than due to low design levels.

There are not any known active faults through the site: The site is not in an AP zone, USGS 2006-1217 Sheet 2 does not delineate faults at the site, etc. The UBC maps delineate the site as being within 2 km of a type B fault (The Chino-

Central Avenue Fault and the Whittier Fault). The IBC criteria (Primary unit assigned as Type B materials):

Latitude / Longitude	≈ 33.83°/-117.64° (Google)
Site Class	Type D
S_S	1.820 for 0.2 sec
S_1	0.661 for 1.0 sec

The design force loads in earthquake engineering should not be confused with the peak accelerations to be expected during earthquakes (Blue Book, Structural Engineers Association of California). Earthquake engineering codes have historically been written with the intent of protecting people as their first priority more than protecting the value of the structure. Damage (whether repairable or irreparable) may be tolerable provided the damage is not injurious to people (Blue Book). Some inelastic deformations and damage may be tolerable in seismic design since the extreme loading is infrequent, possibly only once or twice in the life of the structure (Blue Book).

The magnitude of an earthquake by itself is meaningless to the site and any structures. Magnitude is only a method of representing the amount of energy released in a seismic event. For example, a magnitude 8 earthquake in another continent would not be felt at the site. Site intensity is usually what is important in earthquake engineering. Maximum site intensities are influenced by many factors including: periods, soil depth, soil type, soil sensitivity, distance from the mechanism, shear waves, Love waves, Rayleigh waves, etc.

The site intensity during a close earthquake must be a function of the energy released. Stress drops the order of 500 to 1000 psi are indicated to be expected in a fault mechanism of a seismic event with a shear strain release of 0.0002. A step function shear wave traveling perpendicular to the fault would have area of about 2 fps assuming the velocity was 10,000 fps. Analysis indicates an upper bound of 50%g at a period of 0.5 seconds with a maximum effective acceleration coefficient of 0.25g. Yield level damping at the site for fully ductile structures may be 10% of critical, indicating low amplification factors with similar site and structural periods. At a yield level of 10%g, rough analysis indicates a ductility factor the order of 4 to 6 may be required for a fully ductile structure and its details to sustain a maximum intensity ground motion.

FIELD EXPLORATION AND TESTING

Five exploratory borings were drilled on 8 March 2011. The materials encountered include a thin horizon of topsoils over sedimentary bedrock (N > 50+ bpf).

Nine exploratory trenches were dug in 1989. A phone conversation on 11 Dec 2010 between this writer and the geologist (Patrick Keefe) who logged the trenches as they were dug confirmed the virgin conditions were a horizon of top soils over sedimentary bedrock. Ground water was not encountered. The bedrock materials were indicated to be relatively non expansive (expansive index value of 26). The cohesion testing results were 500 - 800 psf. The angle of internal friction results were 29 - 32 degree ultimate, 33 degrees peak, and 19 degrees residual. For the top soils: the Ph was 7.4, the soluble sulfate was 160 ppm, soluble chloride was 94 ppm, the resistivity was 7740 ohm - meters, etc.

RECOMMENDATIONS

FOUNDATIONS. Structural design criteria:

Friction piers min	: 18"ϕx30'+ at towers, locker, etc
Anchors (dead men)	: 12"ϕ x 10'+ in bedrock
Skin friction	: 500 psf (virgin)
Lateral bearing	: 300 pcf (2 diameters)
Basic active pressure	: 65 pcf EFP + Surcharges
Creep	: 65 pcf EFP top 12'
Stress increases	: 33% for seismic loading
Influence zone	: 45 degrees

For tower 1 and 2 locations, virgin conditions may be assumed from the surface. For tower 3, tower 4, and the equipment locker locations, virgin conditions may be assumed at 13' depth. At the cut pads on the mounds, virgin conditions may usually be assumed at the surface for minor structural bearing:

Minor structural bearing	: 1000 psf TL (virgin)
Friction coefficient	: 0.35 Wdl
Min embedment	: 24"+
Min bearing width	: 15"+

Non structural elements (such as landscape walls, etc.) which are not drilled pier supported and are placed at locations other than the mound pads, may have large movements and short lives.

Creep loading may be neglected for foundation designs where the elements will be placed on the cut pads of the west and north mounds. Fill should probably not be relied upon for support. Structural resistances should only be assumed effective from the surface of the virgin materials. The lateral bearing resistance may be increased by the designated value for each additional foot of depth to a maximum of 10 times the designated value. The total loads should be kept as uniform and as low as practical to help minimize differential settlements. However, the dead loads should be kept as uniform and as high as practical to help counteract any swelling pressures. Lateral sliding frictional resistance should be neglected where there is pier support. Piers closer than with 10′ clearances may require consideration for interaction. Pier spacing should be as large as possible since generally increasing the spacing of the piers will increase the dead loads on the piers, which will help to counteract possible swelling pressures. Final locations (including pier spacing) are to be individually specified. A 45 degree influence zone from disturbed conditions may usually be assumed for clearance.

As needed (including for possible workarounds, etc.), ground penetrating radar may be used to accurately locate the previous trenches. Adjustments are to be field specified by the engineers as needed. Excavations larger or deeper than needed, should probably be backfilled with concrete. Casing, drilling mud, hollow stem augers, treming, etc, may be needed. Steel and concrete should be placed immediately.

Unless designed and built for non drained conditions, retaining elements should have at least sand or free drain rock backfill. There should be a filter fabric between the drain rock and the material to be retained or between the sand backfill and the drain pipe. Retaining walls should have weep holes or alternately perforated drain pipes behind and near the base of the wall. Perforated drain pipes should be below floor or grade elevations that are in front of the wall.

Structures (including any guy wires) should probably be designed and constructed to be as ductile as is practical. Anchors should probably be test loaded.

PROTECTION OF EARTH MATERIALS. The earth materials should be protected with at least a 10 mill plastic membrane where they will be enclosed above or laterally. The earth materials should be protected from non moment resistive concrete elements supported by the grade (such as thin conventional slabs) with: isolation, contraction joints spaced at less than 20', etc. Concrete surfaces should be kept wet for at least three days after being placed. Roof areas should have gutters that are drained well away. Irrigation systems should be of the drip type, timer controlled, and minimally set. The earth materials should be protected from falling runoff (such as with a gravel blanket) inside of the proposed enclosures around the towers. As needed, vegetation should be of erosion resistant types.

SITE GRADING AND EXCAVATION. Call toll free Underground Service Alert (800-642-2444) before any excavation and obtain clearance. As needed, the contractor/owner shall safely shore excavations (including holes). Excavations below the water gradient may require dewatering during their construction. Engineered fill:

> Locations that are to receive engineered fill (if any) should be excavated down to level surfaces of virgin earth materials that are acceptable to the soils engineer. Fill is only to be placed on 10'+ wide level bench steps where practical, in 4" maximum lifts, compacted to 95%, sub-drains in heals, etc. Fill is only to be placed under the observation of, and testing by, the soils engineer. A sample of the proposed fill material is to be delivered to the soils engineer and accepted by him before any delivery of the material is made to the job site - Rock sizes less than 4", PI < 15, etc. Slopes should not exceed 2:1 (H:V).

UNKNOWNS AND MAINTENANCE. Future maintenance must be provided. Continual observation shall be made for any signs of related problems. Related problems or different conditions should be reported to us immediately so they can be investigated and appropriate mitigation measures may be commenced if needed.

REVIEWS AND OBSERVATIONS. The plans and details of the proposed improvements should be submitted to us for review. Observations should be performed during construction. The recommendations are subject to my observation and possible modification.

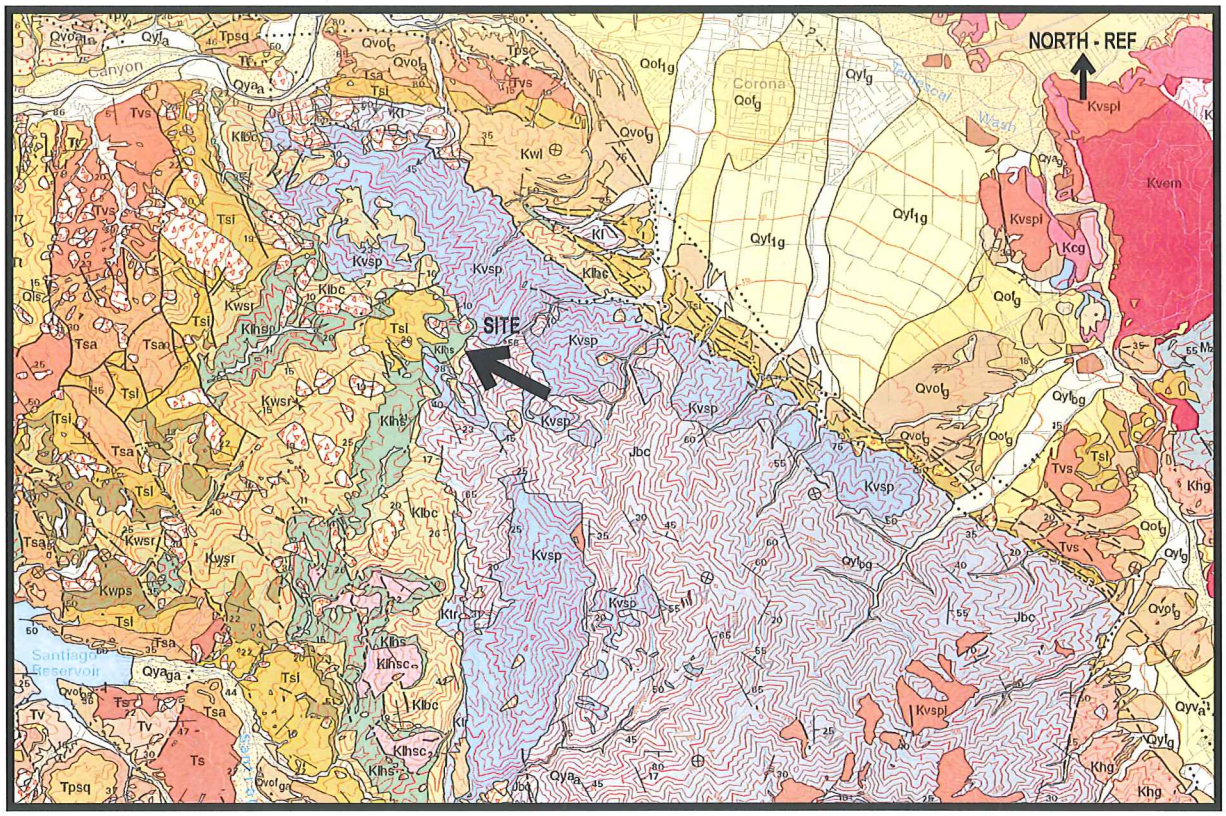
We trust there is a good understanding of the situation and the performance required. Services are performed with the standard limitations and conditions. For any comments or questions, call toll free 800-USsoils.

Charles H. Hartsog

Soils Engineer

CRAWFORD BROADCASTING, 9193 BLACK STAR CANYON ROAD, SILVERADO, CA.

USGS GEOLOGY MAP
SOURCE: USGS 2006-1217, 99-172, ETC.



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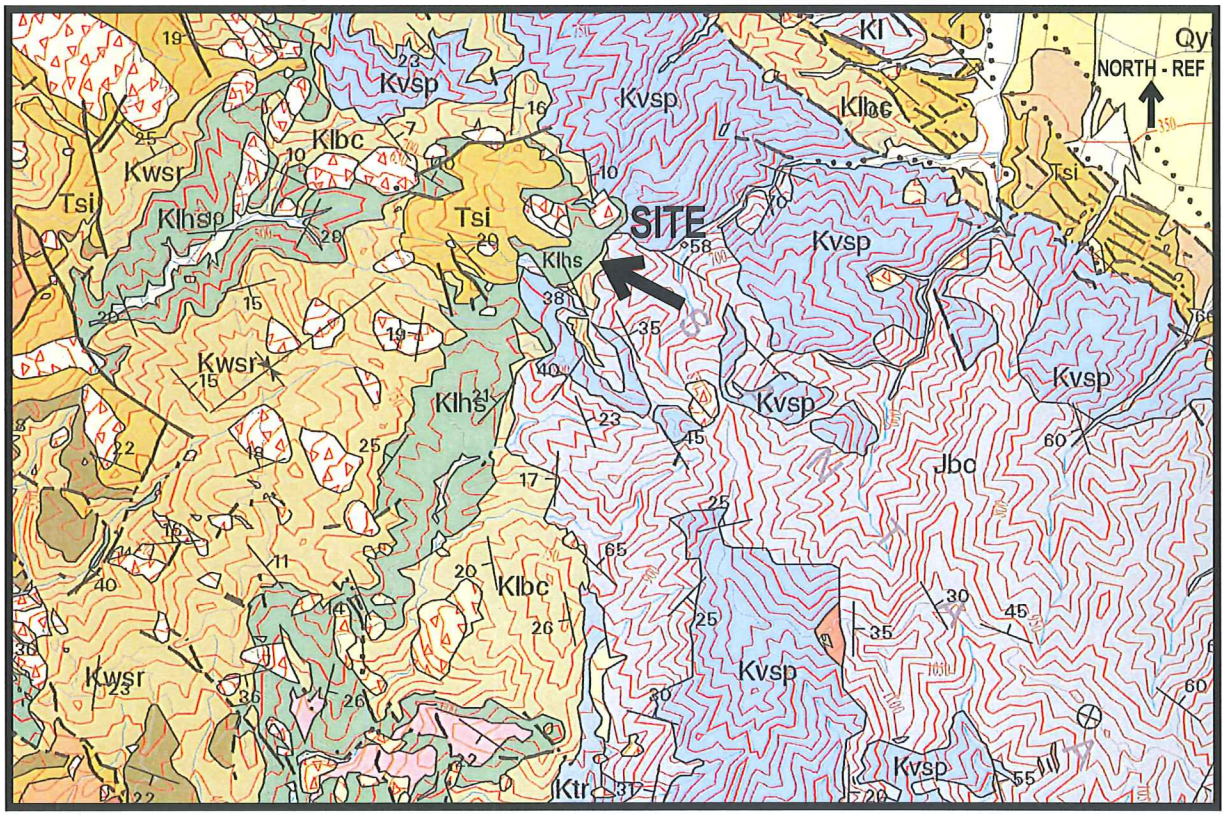
USGS GEO PLATE

CRAWFORD BROADCASTING, 9193 BLACK STAR CANYON ROAD, SILVERADO, CA.

USGS GEOLOGY MAP
SOURCE: USGS 2006-1217, 99-172, ETC.



LEGEND (OF 2006 - 1217, etc.)

Klhs	Holtz Shale member (Ladd Formation)
Jbc	Bedford Canyon Formation, undifferentiated
Klbc	Baker Canyon Conglomerate member (Ladd Formation)

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USGS GEO
CLOSE

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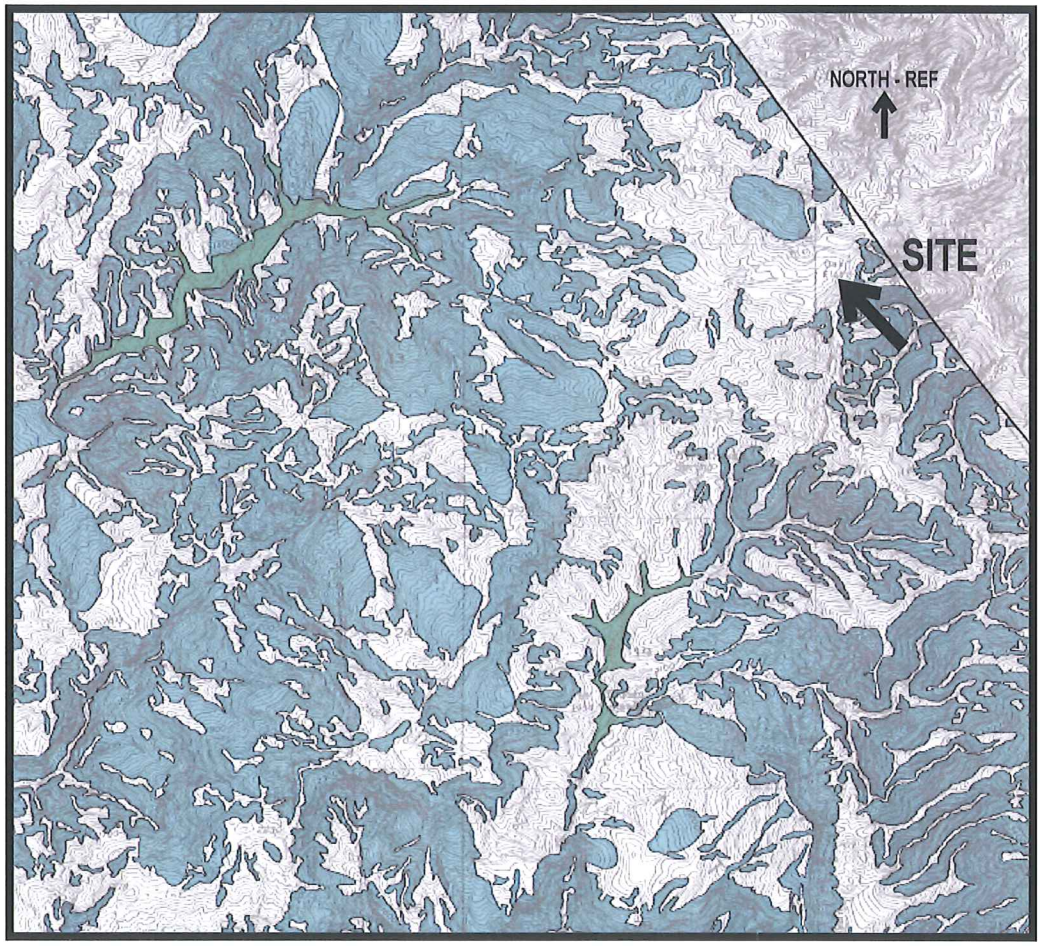
CGS SEIMIC HAZARDS VICINITY MAP
SOURCE: CGS MAPS



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SEISMIC HAZARDS

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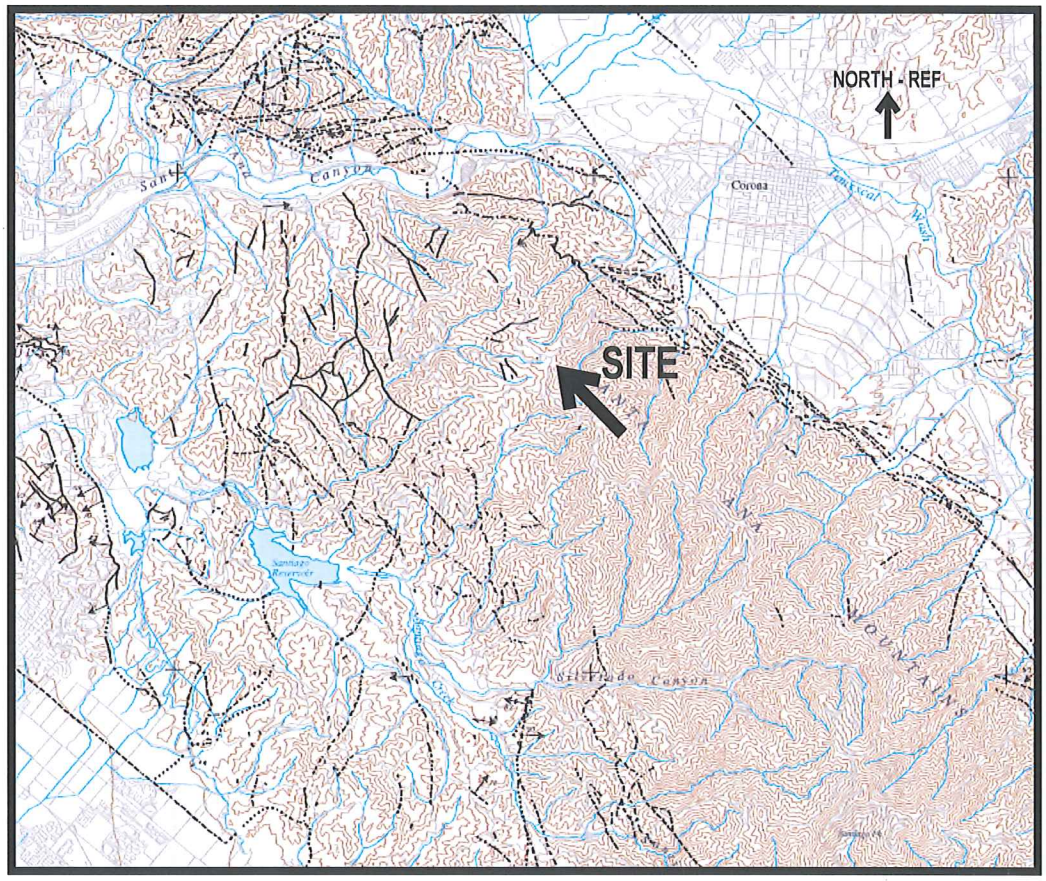
USGS FAULT VICINITY MAP
SOURCE: USGS 2006-1217



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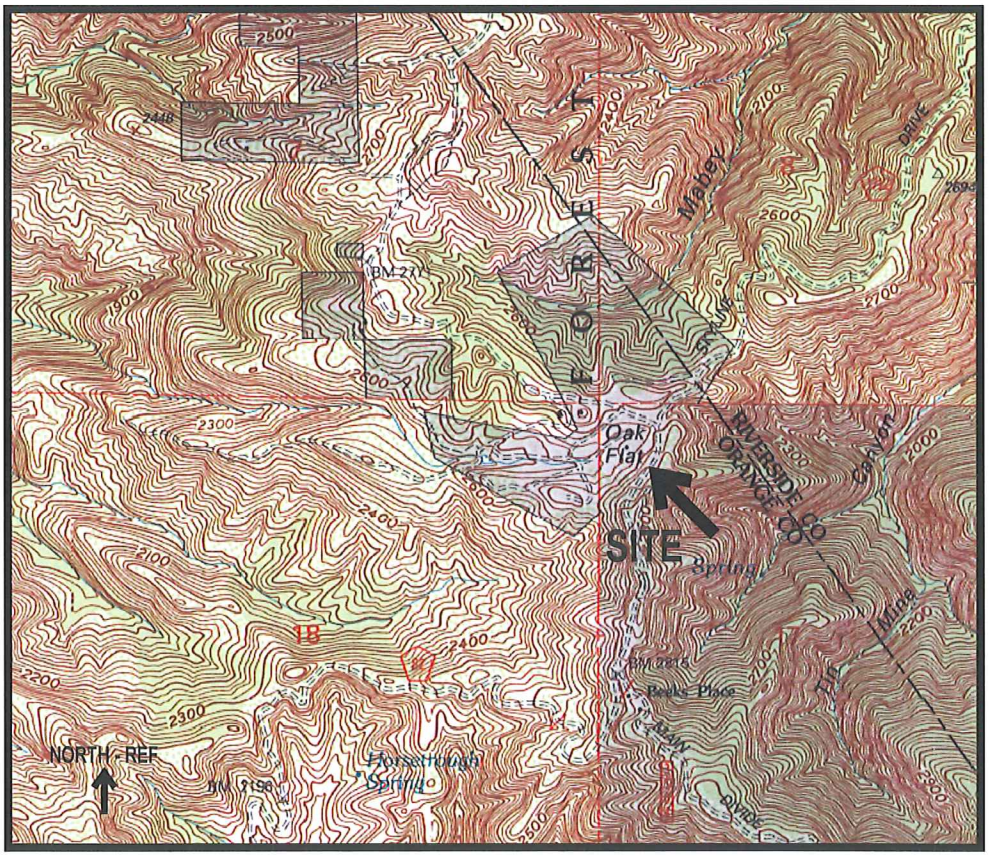
FAULT VICINITY

CRAWFORD BROADCASTING, 9193 BLACK STAR CANYON ROAD, SILVERADO, CA.

USGS GEOLOGY MAP
SOURCE: USGS QUADS



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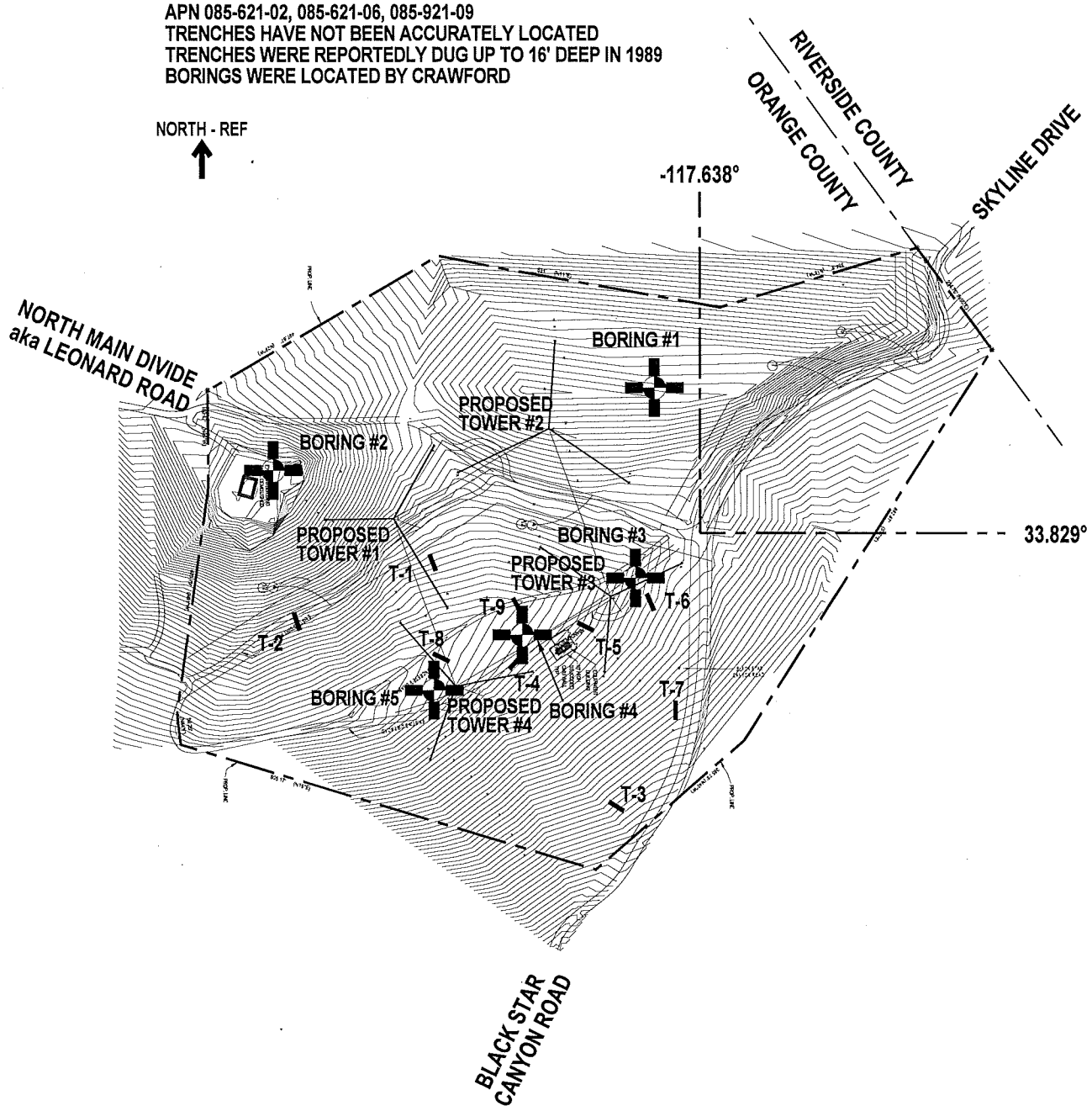
USGS TOPO PLATE

CRAWFORD BROADCASTING, 9193 BLACK STAR CANYON ROAD, SILVERADO, CA.

ROUGH SITE PLAN

NOT TO SCALE: 1" DOES NOT EQUAL 300'+-
DATA FURNISHED BY OTHERS
APN 085-621-02, 085-621-06, 085-921-09
TRENCHES HAVE NOT BEEN ACCURATELY LOCATED
TRENCHES WERE REPORTEDLY DUG UP TO 16' DEEP IN 1989
BORINGS WERE LOCATED BY CRAWFORD



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SITE PLATE

CHARLES H. HARTSOG / EXPLORATORY BORING LOG

LOCATION: 9193 Black Star Cyn Rd, Silverado

GROUND WATER: Not Encountered

DATE DRILLED: 8 March 2011

APN: 085-621-02, 085-621-06, 085-921-09

DRILLING TYPE: CME Truck 8" hollow stem augers

DRILLED BY: 2R, Jerry and Ish

DESCRIPTION OF MATERIALS / NOTES	DEPTH, feet	SAMPLER SIZE OD, inches	PENETROMETER, tsf	DRY DENSITY, pcf	MOISTURE CONTENT, %	STANDARD PENETRATION, 140# bpf	UNCONFINED COMPRESSIVE STRENGTH, tsf	ANGLE OF INTERNAL FRICTION, deg	SHEARING ANGLE, deg	TORVANE, tsf
Brown Sandy CLAY (CL)	2'									
	4'									
5' deep 140# SPT = 29/41/55, N = 96 bpf Sample was drive fissured	6'	2"	4+			96				1+
	8'									
	10'									
?	12'									
Black Siltstone - Hard	14'									
Hard pebble at 16' depth, inches thick	16'									
	18'									
Augering terminated at 20' depth	20'									
20' deep 140# SPT = 26/38/58, N = 96 bpf Ground water was not encountered Bottom of exploration at about 21.5' Sample was drive fissured		2"	4+			96				1+
	22'									
	24'									
	26'									
	28'									
	30'									

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BORING 1
PLATE

CHARLES H. HARTSOG / EXPLORATORY BORING LOG

LOCATION: 9193 Black Star Cyn Rd, Silverado

GROUND WATER: Not Encountered

DATE DRILLED: 8 March 2011

APN: 085-621-02, 085-621-06, 085-921-09

DRILLING TYPE: CME Truck 8" hollow stem augers

DRILLED BY: 2R, Jerry and Ish

DESCRIPTION OF MATERIALS / NOTES	DEPTH, feet	SAMPLER SIZE OD, inches	PENETROMETER, tsf	DRY DENSITY, pcf	MOISTURE CONTENT, %	STANDARD PENETRATION, 140# bpf	UNCONFINED COMPRESSIVE STRENGTH, tsf	ANGLE OF INTERNAL FRICTION, deg	SHEARING ANGLE, deg	TORVANE, tsf
Tan Brown Sandy CLAY (CL)	2'									
	4'									
5' deep 140# SPT = 9/7/9, N = 16 bpf Sample was drive fissured	6'	2"				16				1+
	8'									
	10'									
?	12'									
Black Siltstone - Hard	14'									
	16'									
	18'									
Augering terminated at 20' depth	20'									
20' deep 140# SPT = 15/27/ 31, N = 58 bpf Ground water was not encountered Bottom of exploration at about 21.5' Sample was drive fissured and shattered		2"	4+			58				1+
	22'									
	24'									
	26'									
	28'									
	30'									

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BORING 2 PLATE

CHARLES H. HARTSOG / EXPLORATORY BORING LOG

LOCATION: 9193 Black Star Cyn Rd, Silverado

GROUND WATER: Not Encountered

DATE DRILLED: 8 March 2011

APN: 085-621-02, 085-621-06, 085-921-09

DRILLING TYPE: CME Truck 8" hollow stem augers

DRILLED BY: 2R, Jerry and Ish

DESCRIPTION OF MATERIALS / NOTES	DEPTH, feet	SAMPLER SIZE OD, inches	PENETROMETER, tsf	DRY DENSITY, pcf	MOISTURE CONTENT, %	STANDARD PENETRATION, 140# bpf	UNCONFINED COMPRESSIVE STRENGTH, tsf	ANGLE OF INTERNAL FRICTION, deg	SHEARING ANGLE, deg	TORVANE, tsf
Brown Sandy CLAY (CL)	2'									
	4'									
5' deep 140# SPT = 2/3/12, N = 15 bpf Sample was drive fissured	6'	2"				15				.7?
?	8'									
	10'									
Black Siltstone - Very hard	12'									
	14'									
	16'									
	18'									
20' deep 140# SPT = 20/41/52, N = 93 bpf Sample was drive fissured	20'	2"	4+			93				1+
	22'									
	24'									
	26'									
Extremely hard at 28' depth	28'									
	30'									
Augering terminated at 30' depth Ground water was not encountered										

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BORING 3
PLATE

CHARLES H. HARTSOG / EXPLORATORY BORING LOG

LOCATION: 9193 Black Star Cyn Rd, Silverado

GROUND WATER: Not Encountered

DATE DRILLED: 8 March 2011

APN: 085-621-02, 085-621-06, 085-921-09

DRILLING TYPE: CME Truck 8" hollow stem augers

DRILLED BY: 2R, Jerry and Ish

DESCRIPTION OF MATERIALS / NOTES	DEPTH, feet	SAMPLER SIZE OD, inches	PENETROMETER, tsf	DRY DENSITY, pcf	MOISTURE CONTENT, %	STANDARD PENETRATION, 140# bpf	UNCONFINED COMPRESSIVE STRENGTH, tsf	ANGLE OF INTERNAL FRICTION, deg	SHEARING ANGLE, deg	TORVANE, tsf
Brown Sandy CLAY (CL)	2'									
	4'									
5' deep 140# SPT = 13/14/18, N = 32 bpf Sample was drive fissured	6'	2"				32				1+
	8'									
	10'									
	12'									
	14'									
?	16'									
Black Siltstone	18'									
Augering terminated at 20' depth 20' deep 140# SPT=32/81/term, N=100+ bpf Ground water was not encountered Bottom of exploration at about 21.5' Sample was drive shattered	20'	2"	4+			100+				1+
	22'									
	24'									
	26'									
	28'									
	30'									

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BORING 4
PLATE

CHARLES H. HARTSOG / EXPLORATORY BORING LOG

LOCATION: 9193 Black Star Cyn Rd, Silverado

GROUND WATER: Reached, Not Penetrated

DATE DRILLED: 8 March 2011

APN: 085-621-02, 085-621-06, 085-921-09

DRILLING TYPE: CME Truck 8" hollow stem augers

DRILLED BY: 2R, Jerry and Ish

DESCRIPTION OF MATERIALS / NOTES

DEPTH, feet	SAMPLER SIZE OD, inches	PENETROMETER, tsf	DRY DENSITY, pcf	MOISTURE CONTENT, %	STANDARD PENETRATION, 140# bpf	UNCONFINED COMPRESSIVE STRENGTH, tsf	ANGLE OF INTERNAL FRICTION, deg	SHEARING ANGLE, deg	TORVANE, tsf
Brown Sandy CLAY (CL)									
5' deep 140# SPT = 11/19/16, N = 35 bpf Sample was drive fissured	2"				35				1+
10' deep 140# SPT = 14/12/11, N = 23 bpf Sample was drive fissured	2"				23				1+
?									
Black Siltstone 15' deep 140# SPT=19/64/85, N = 149 bpf Sample was drive fissured Augering terminated at 15' depth Bottom of exploration at about 16.5'	2"	4+			149				1+

2' 4' 6' 8' 10' 12' 14' 16' 18' 20' 22' 24' 26' 28' 30'

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BORING 5
PLATE

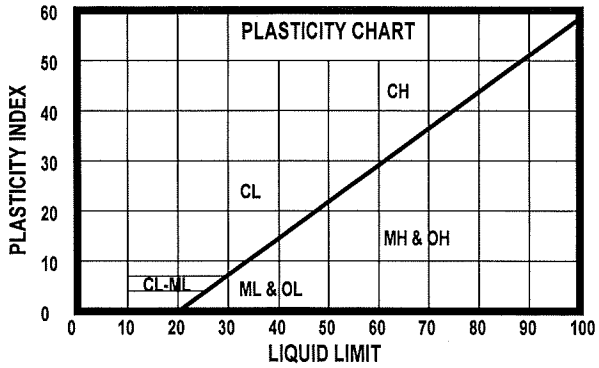
CHARLES H. HARTSOG / UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (MORE THAN 50% RETAINED ON NUMBER 200 SIEVE)	GRAVELS (50% OR MORE OF COARSE RETAINED ON NUMBER 4 SIEVE)	CLEAN GRAVELS	GW	Well graded gravels and gravel sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels, gravel sand silt mixtures
			GC	Clayey gravels, gravel sand clay mixtures
	SANDS (MORE THAN 50% OF COARSE PASSES NUMBER 4 SIEVE)	CLEAN SANDS	SW	Well graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands little or no fines
		SANDS WITH FINES	SM	Silty sands, sand silt mixtures
			SC	Clayey sands, sand clay mixtues
FINE GRAINED SOILS (50% OR MORE PASSES NUMBER 200 SIEVE)	SILTS AND CLAYS	LL =< 50%	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
		LL > 50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS			PT	Peat, muck and other highly organic soils

SANDS	BLOWS / FOOT	
VERY LOOSE	-	4
LOOSE	4	10
MEDIUM DENSE	10	30
DENSE	30	50
VERY DENSE	50	

SILTS AND CLAYS	SPT (BPF)		UC STRENGTH (TSF)	
VERY SOFT	-	2	-	1/4
SOFT	2	4	1/4	1/2
FIRM	4	8	1/2	1
STIFF	8	16	1	2
VERY STIFF	16	32	2	4
HARD	32		4	

MATERIAL TYPE	SIEVE SIZES	
SILTS AND CLAYS	-	200
FINE SAND	200	40
MEDIUM SAND	40	10
COARSE SAND	10	4
FINE GRAVEL	4	3/4"
COARSE GRAVEL	3/4"	3"
COBBLES	3"	12"
BOULDERS	12"	



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CLASSIFICATION KEY PLATE

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On Monday Morning, June 13, 2011

Mr. Cris Alexander
Crawford Broadcasting Company
2821 South Parker Road Suite 1205
Aurora, Colorado 80014
303-433-0104, 303-433-0905 fax

RE: Soils And Geotechnical Report For Proposed New Towers At Oak Flat, 9193 Black Star Canyon Road, Silverado, CA 92676 (APN 085-621-02, 085-621-06, 085-921-09.

Thank you for your inquiry on Friday morning. In answer:

1. Question: "Which small valley ?" (Page 1 line 46):

   Answer: This is the valley that has already been delineated and is where Crawford is proposing to locate the four towers.

2. Question: "?" (Page 2 line 5):

   Answer: The map data is only preliminary. Nevertheless, our recommendations were based upon borings, testing, etc.

Charles Hartsog

Cc:
Mr. Ray Grage
Project Engineer
1930 West San Marcos Blvd # 84
San Marcos, CA 92078
760-598-8615, 866-852-0360 fax
760-598-0616 cell

Exp 3/31/13

REGISTERED PROFESSIONAL ENGINEER
CHARLES H. HARTSOG
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GEOTECHNICAL
SOILS
STATE OF CALIFORNIA

AAKO GEOTECHNICAL ENGINEERING CONSULTANTS, INC.
2483 E. ORANGETHORPE AVE. / FULLERTON, CA 92631-5304 / (714) 773-1232 Toll Free: (800) 422-4117

GEOTECHNICAL ENGINEERING INVESTIGATION
PLANNED TRANSMITTER BUILDING PAD
AND THREE (3) RADIO ANTENNA TOWERS
WITH ACCOMPANYING SUBSURFACE RADIAL GROUND SYSTEM
BLACKSTAR CANYON ROAD AT ORANGE/RIVERSIDE COUNTY LINE
ORANGE COUNTY, CALIFORNIA
JOB NO. 8518-G1-A9

12 June 1989

PREPARED FOR:

Orange County Broadcasting
606 North Larchmont Boulevard, Suite 100
Los Angeles, California 90004
Attention: Danny Villaneuva

SCOPE

The scope of this investigation was designed to determine and evaluate the surface and subsurface geotechnical conditions on the subject site as they relate to the proposed development. The scope included the following geotechnical functions:

- Review of available literature pertaining to the site, including a review of near-field faulting and active fault potential.
- Stereoscopic analysis of sequential vertical aerial photographs of the site.
- Reconnaissance mapping of geologic and manmade features at the site and contiguous areas.
- Excavation and logging of eight (8) exploratory backhoe trenches.
- Recovery of representative bulk and undisturbed soil and bedrock samples from the excavations for laboratory testing.
- Laboratory testing of selected earth materials.
- Geotechnical analysis of data obtained during the investigation.
- Preparation of this report and the accompanying illustrations to present our findings, conclusions, and recommendations pertaining to the planned construction.

LOCATION

The subject property is located in the Oak Flat area of the County of Orange on Blackstar Canyon Road approximately 1000 feet southwest of the Riverside/Orange County line.

Contiguous properties are hereby briefly described:

- **Northerly** - County dirt road, moderately to steeply sloping natural terrain, existing radio antenna towers, and single story structure.
- **Southerly** - Moderately to steeply sloping natural terrain.
- **Westerly** - Moderately to steeply sloping natural terrain.
- **Easterly** - Blackstar Canyon Road and moderately to steeply sloping natural terrain.

SITE DESCRIPTION

As shown on the Site Plan/Geologic Map the site comprises an elongated polygonal shaped parcel at the head of a southwest trending canyon in the Oak Flat area of the Santa Ana Mountains. Natural slopes ranging in inclination from 2:1 to 6:1 (horizontal to vertical) descend in all directions creating a southwesterly facing amphitheater. Several small

FIELD INVESTIGATION

A field investigation consisting of reconnaissance geologic mapping and subsurface exploration was conducted on 5 June 1988. Eight (8) exploratory trenches were excavated to a maximum depth of 16 feet using a rubber tire backhoe. Earth materials encountered in the exploratory trenches were logged by the undersigned Engineering Geologist or his representative. The approximate trench locations are shown on the enclosed Site Plan/Geologic Map, Drawing 4 in Appendix 'D'. Logs of the trenches are included in Appendix 'B'.

Representative bulk and undisturbed samples of earth materials were obtained at frequent intervals from the trenches. Undisturbed samples were obtained by hand-driving 3 inch long, 2.413 inch (inside) diameter rings with a 4-pound hammer and special driving adapter, or by pushing a thin walled steel sampler with the backhoe bucket. Samples were retained in close fitting moisture proof containers and transported to the laboratory for testing.

Exploratory trenches used for subsurface exploration were backfilled prior to leaving the site. As with any backfill in an area as small and deep as a trench, consolidation and subsidence may result in time, causing depression of the excavation area and a potentially hazardous condition. The client and/or owner of the property are hereby advised to periodically examine the excavation areas, and if necessary backfill any resulting depressions. Aako Geotechnical Engineering Consultants, Inc. shall not be responsible for injury or damage resulting from trench backfill settlement.

EARTH MATERIALS

Minor amounts of artificial fill underlie the outer perimeter of the dirt roads along the northeast and west portions of the site. The sloping portions of the site are mantled by slopewash and various minor surficial creep deposits. The central portion of the site has been affected by deep creep which ranges from 4 to 12 feet in depth. Alluvium derived from the slopes mantles the reentrants and alluvial channel. The entire site is underlain at depth by competent bedrock. Detailed descriptions of earth materials are presented in the logs of exploratory trenches and borings in Appendices 'B' and 'C'. The following is a brief description of the materials:

- **Fill (Symbol: af)** - Moderately dense clayey silt, derived from the near surface slopewash. Contains fragments of weathered siltstone bedrock scattered throughout. Maximum thickness is approximately 1 to 3 feet.

- **Slopewash (Symbol: Qsw)** - Slopewash consists of clayey silt and fine sandy clayey silt. The slopewash contains abundant rootlets and scattered bedrock fragments. Desiccation cracking was noted throughout the near surface deposits. Slopewash thicknesses range in depth from 1 to 8 feet or more.

BEDROCK STRUCTURE/FAULTING

Locally the predominant structure of the Holtz Shale member is characterized by west to northwesterly dipping strata. As exhibited in outcrops and exploratory trenches on and within close proximity of the site, the bedrock has been cut by at least three (3) sets of joint fractures. These features were undoubtedly imparted by minor ancient faults and folds associated with uplift of the area in the geologic past. The result is bedrock dipping 8 to 50 degrees toward the west with several variations due to localized folding. Average dip of bedding throughout most of the site is approximately 20 to 35 degrees.

- **Bedding Development** - Well bedded, undulatory and thin to interlaminated.
- **Attitude of Bedding** - Average dip 20 to 35 degrees westerly.
- **Attitude and Development of Jointing** - Moderately to steeply dipping with strikes in all directions; slightly open to tight and moderate to well developed; some joints marked by limonite and caliche staining.
- **Faulting** - Minor faults were noted in exploratory trench T-8. These faults have had no recent marked influence on the local terrain and were not observed to offset slopewash deposits.

GROUNDWATER

No surface seeps or springs were observed during the investigation. However, groundwater derived from incident rainfall and concentrated in the existing drainage course may adversely affect the planned development. Mitigating recommendations are presented herein.

SEISMICITY

No active or potentially active faults (i.e., having ruptured during the last 11,000 years and 1.2 million years, respectively) are known to transect the site. However, the site is located in earthquake prone Southern California. Proximally, as well as regionally, there is evidence of geologically youthful fault movement. Significant faults, historic earthquake epicenters, and their location relative to the site are delineated on the Fault Location Map, Drawing 1 in Appendix 'D'. The site is not located within the limits of an Alquist Priolo Special Studies Zone and does not require the special fault study.

Corrosion Test

A corrosion test was performed on a representative soil sample in accordance with California Test Method 417, 422 and 643. The following results were obtained:

Soil Type: Fine Sandy Clayey Silt

pH: 7.14
Soluble Sulfate: 160 ppm
Soluble Chloride: 94 ppm
Minimum Resistivity: 7740 ohm/cm

Test results indicate a low corrosion potential for concrete and a moderate corrosion potential for buried metal in direct contact with the on-site soils. Type II cement may be used for concrete foundations and slabs.

CONCLUSIONS AND RECOMMENDATIONS

In the opinion of the undersigned, the subject property is suitable for the proposed development from a soil engineering and engineering geologic standpoint, provided the recommendations contained herein are incorporated into the project designs and specifications. If these recommendations are adhered to, the following general conclusions can be made:

- Bedrock at the site will adequately support the planned structures and compacted fills.
- The proposed structures, grading, and other site improvements will be safe from hazards due to landslide, slippage, or settlement.
- Adjacent properties or their structures will not cause adverse safety hazards or instability to the proposed development.

The following conclusions and recommendations pertain to site conditions and necessary mitigating measures. Specific detailed recommendations for construction are presented in succeeding sections.

- No known active or potentially active faults transect the subject property or proximity.
- Existing fill, slopewash, deep creep material, and near surface alluvium and weathered bedrock are deemed unsuitable for the support of compacted fill and/ or structural loads which will be imposed by the planned development. It is estimated that 3 to 12 feet or more of unsuitable material may cover some portions of the site. Removal of these materials will be required prior to placement of new fill.

- Drainage swales shall be constructed behind all retaining walls and above all cut slopes. The swales should have positive drainage devices installed to conduct run-off from the site in a nonerosive manner.

- All slope and roof drainage should be collected and conducted to the street or approved drainage course in a non-erosive manner. Special drainage consideration should be given to slope areas that have experienced concentrated runoff (i.e., erosional gullies) from existing dirt roads and higher ground elevations.

SEISMIC DESIGN CRITERIA

A repeatable ground acceleration of 0.40g may be expected to affect the site within the economic lifetime of the planned dwelling. Uniform Building Code Seismic design requirements are based upon criteria limited to fulfilling life safety concepts. Reference #17 states that structures designed in accordance with the provisions of the Uniform Building Code should be able to resist major earthquakes of the severity anticipated at the subject site without collapse, although structural damage could occur. The reference also indicates than an arbitrary peak rock acceleration of 0.30g for Seismic Zone 4 has been assumed for derivation of seismic formulas presented in Chapter 23 of the Uniform Building Code.

Based on Uniform Building Code acceptance of some structural damage without collapse, the subject development may be designed in accordance with the seismic requirements presented in the Uniform Building Code. It is the responsibility of the Project Structural Engineer to determine and implement the critical seismic factors to be used for building and structure design and to implement the applicable sections of the code.

ROUGH GRADING RECOMMENDATIONS

Removal of Unsuitable Earth Materials

All existing vegetation and debris shall be removed from areas to receive compacted fill. Man-made objects shall be overexcavated and exported from the site. Trees shall be completely removed, ensuring that a minimum of 95% of the root systems are extracted. Removal of unsuitable earth materials will be required and may result in excavation to depths ranging from 3 to 12 feet or more below existing site grade.

The project Soils Engineer and/or Engineering Geologist shall inspect and approve all removal areas prior to placement of any new compacted fill.

installed with a minimum of 6 inches of filter material underlying the pipe. The filter material shall be wrapped with a geotextile filter fabric. The pipe shall be installed with holes down at a gradient of at least 2%. The outlet pipe shall be comprised of a 6 inch diameter solid pipe (Schedule 40 or stronger - Schedule 35 is not acceptable).

Subdrain and outlet pipes shall be installed in such a manner that they are not damaged by compaction equipment. The outlets shall be marked and must be observed to outlet properly following completion of grading. Subdrains will be tested for integrity following placement of approximately 6 feet of fill over the pipes. The test will consist of rolling a small diameter ball through the pipe. If the test fails, measures must be taken to clear obstructions from the pipes and the test repeated until it passes.

During grading, areas may be encountered that will require additional lateral subdrains. The need for such drains shall be determined by the Engineering Geologist during site grading.

Each phase of subdrain installation shall be observed and approved by the project Engineering Geologist or his representative.

Subdrain Installation

A subdrain system shall be installed at the rear of all fill keys. Drains shall also be installed in areas of high ground moisture at the discretion of the project Engineering Geologist.

Fill key drains shall consist of a 4 inch diameter perforated pipe ('ASTM Schedule-40' or stronger - 'ASTM Schedule-35' is not acceptable) installed in either a backhoe trench or deep 'V' ditch with a minimum of 6 cubic feet of geotextile filter fabric wrapped 3/4 inch crushed filter rock per linear foot.

Subdrains shall be installed with a minimum of 6 inches of filter gravel underlying the pipe. The pipe shall be installed with holes down at a gradient of at least 2%. Outlet pipes shall consist of solid pipe ('ASTM Schedule-40 or stronger - 'ASTM Schedule-35 is not acceptable) and shall be installed at a maximum spacing of 100 linear feet along the perforated pipe drain. Outlets shall be installed in such a manner that they are not damaged by compaction equipment. Outlets shall be marked and must be observed to drain properly following completion of grading.

Each phase of subdrain installation shall be observed and approved by the project Engineering Geologist or his representative.

Cut Slopes

Finish cut slopes shall not be inclined steeper than 2:1 (horizontal to vertical).

Shrinkage Factors

A shrinkage factor of 16 to 17 percent for soil and slopewash and 0 to 1 percent for bedrock may be assumed in estimating earthwork quantities. Subsidence or rebound of the underlying bedrock, due to loading or unloading during the planned grading operation, is expected to be minimal.

FOUNDATION RECOMMENDATIONS

A foundation system utilizing continuous and spread footings is recommended for the support of the proposed transmitter structure. Footings shall be founded into properly compacted fill or bedrock. It is anticipated that all foundations will rest on compacted fill.

- Footings in bedrock or properly compacted fill, comprised of on-site slopewash materials or reworked alluvium or bedrock, shall be founded a minimum of 18 inches below lowest adjacent finish grade. Continuous footings shall be a minimum width of 12 inches and shall be reinforced with at least one (1) #4 reinforcing bar at the top and one (1) #4 reinforcing bar at the bottom of the footings.

  A safe allowable bearing value of 1500 p.s.f. is recommended for the design of the continuous and spread footings at a typical 12-inch width and a typical 18 inch depth. This value may be increased 10% for each additional foot of depth and/or width, to a maximum of 3000 p.s.f. A 1/3 increase in the above bearing value may be used when considering short term loading from wind or seismic sources. Foundations designed with this bearing value are not anticipated to exceed a maximum settlement of 1/2 inch or a differential settlement of 1/4 inch.

- The new structures should be designed in accordance with the seismic design data contained in the 'SEISMIC DESIGN' section of this report.

DRILLED CAST-IN-PLACE FRICTION PILE OR DRILLED PIER RECOMMENDATIONS

A foundation system utilizing cast-in-place piles or drilled piers is recommended for the support of the proposed antenna towers and guy wire anchors. Piles or piers shall be a minimum of 18 inches in diameter and shall be spaced a minimum of 3 times the diameter of the pile. There are no limits on maximum pile spacing, although a 6 foot minimum spacing is recommended to allow for deviation in vertical alignment during drilling.

All roof and canopy drainage shall be conducted to the street or off the site in an approved non-erosive manner. Site drainage shall be accomplished in an approved manner to prevent erosion or instability.

Water from off-site sources shall not be allowed to discharge on the subject property, or should be conducted across the site in a non-erosive manner.

TRENCH BACKFILL RECOMMENDATIONS

Utility trench excavations in slope areas or within the zone of influence of structures should be properly backfilled in accordance the following recommendations:

- Lines shall be bedded with a minimum of 6 inches of 3/8 inch pea gravel or approved granular soil. Similar material shall be used to provide a cover of least 1 foot over the pipe. This backfill shall then be uniformly compacted by mechanical means to a firm and unyielding condition. Water jetting of the granular soil is not recommended.

- Remaining backfill may be fine grained soil. It shall be placed in lifts not exceeding 6 inches in thickness, watered or aerated to near optimum moisture content, and mechanically compacted to a minimum of 90% of the laboratory maximum density.

- Lines in trenches within 5 feet of the top of slopes or on the face of slopes, shall be bedded and backfilled with 3/8 inch pea gravel or approved granular soil as described above. The remainder of the trench backfill shall comprise typical on-site fill soil mechanically compacted as described in the previous paragraph.

GRADING PLAN REVIEW

Subsequent to formulation of final development plans and specifications but prior to construction, grading and foundation plans should be reviewed by the geotechnical consultant to verify compatibility with site geotechnical conditions and conformance with recommendations contained herein.

CONSTRUCTION OBSERVATION

All rough grading of the property must be performed under geological and engineering observation of Aako Geotechnical Engineering Consultants, Inc. Rough grading includes, but is not limited to, grading of overexcavation cuts, fill placement, and excavation temporary and permanent cut slopes.

CLOSURE

The undersigned warrant that this report was prepared in accordance with generally accepted principles and practice in the fields of engineering geology and soils engineering. This warranty is in lieu of all other warranties, either expressed or implied.

The findings, conclusions, and recommendations presented herein reflect our best estimate of soil and bedrock conditions based on interpolation of data obtained from limited subsurface exploration performed during the field investigation. The conclusions and recommendations are based on generally accepted engineering principles and practices. No further warranties are implied nor made.

Actual distribution of earth materials beneath the surface of the site may vary from the interpretation presented herein. Should such variations or other unusual conditions become apparent during grading and development, this office shall be contacted to 1) evaluate these conditions prior to continuation of work, and 2) to make any necessary revisions to the recommendations of this report.

This office shall be notified if changes of ownership occur or if final plans for the site development indicate differing location or type of structure, or loading conditions other than those presented in this report.

If the site is not developed or grading does not begin within 24 months following the date of this report, further investigation may be required to ensure that surface and/or subsurface conditions have not changed.

Any charges for necessary review or updates will be at the prevailing rate at the time the review work is performed.

-oOo-

PERTINENT REFERENCES

1. Acreage Land Systems, Inc., "Preliminary Grading Plan", Undated.

2. Albee, A.L., and Smith, J.L., 1966, "Earthquake Characteristics and Fault Activity in Southern California", in 'Engineering Geology in Southern California', Association of Engineering Geologists Special Publication.

3. Barrows, Allen G., 1974, "A Review of the Geology and Earthquake History of the Newport-Inglewood Structural Zone, Southern California", Division of Mines and Geology, Special Report 114.

4. Bonilla, M.G., 1970, "Surface Faulting and Related Effects", in Weigel, R.L., editor, 'Earthquake Engineering', Prentice-Hall, Inc., Inglewood Cliffs, N.J. pp. 47-74.

5. California Division of Mines and Geology, 1972, "Provisional Fault Map of California", Seismic Safety Information Map 72-1.

6. California Division of Mines and Geology, 1972, "Faults and Earthquakes in California", Seismic Safety Information, 72-7.

7. California Division of Mines and Geology, 1972, "Guidelines to Geologic and Seismic Reports", C.D.M.G. note 37.

8. California Division of Mines and Geology, 1975, "Guidelines for Evaluating the Hazard of Surface Fault Rupture", C.D.M.G. Note 49.

9. Hart, E.W., 1985, "Fault Rupture Hazard Zones in California", California Division of Mines and Geology, Special Publication 42.

10. Moran, D.E., et al, October 1973, "Geology, Seismicity, and Environmental Impact", Association of Engineering Geologists, Special Publication.

11. Proctor, R.J., 1973, "Map of Major Earthquakes and Recently Active Faults in the Southern California Region: In Geology, Seismicity and Environmental Impact", Special Publication, Association of Engineering Geologists.

12. Rogers, T.H., 1965, "Geologic Map of California, Santa Ana Sheet, Olaf P. Jenkins Edition", Scale, 1:250,000.

13. Rogers, T.H., R.G., 1967, "Geologic Map of California, San Bernardino Sheet, Olaf P. Jenkins Edition", Scale, 1:250,000.

14. Schoellhammer, J.E., Vedder, F.G., Yerkes, R.E., and Kinney, D.M. 1981, "Geology of the Northern Santa Ana Mountains, California, United States Geologic Survey Professional Paper 420-D.

APPENDIX 'B'

EXPLORATORY TRENCH LOGS
T-1 THROUGH T-9

TRENCH LOG NO. T-2

Job No.: 8518-G1-A9

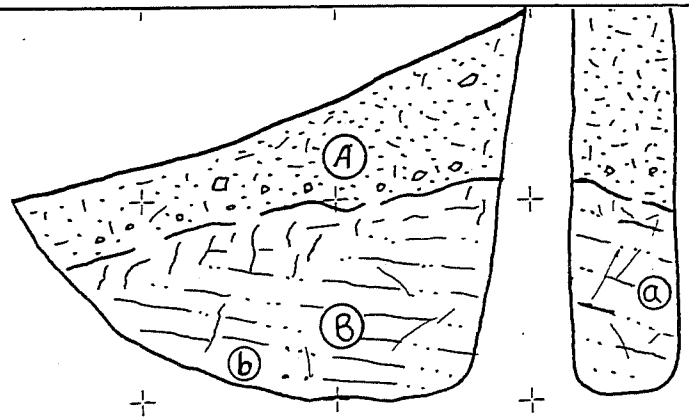
Logged By: P.K. Orientation: N15W Elev.: Date: 6/5/89

Client: Orange County Broadcasting Site: Blackstar Canyon Rd., Orange Co., CA.

EARTH MATERIALS	ATTITUDES
A) Slopewash - Very fine sandy clayey SILT, mottled olive gray and medium brown, moderately moist to moist, moderately dense, rootlets throughout, 10-12% open voids, krotovena to 3" in diameter, scattered bedrock fragments to 4" in diameter, moderately well developed ped faces at depth, some desiccation cracking. B) Bedrock - SILTSTONE, clayey very fine sandy, mottled pale olive gray to orange brown, moderately moist to moist, stiff to hard, well jointed, tightly jointed, thinly bedded to laminated, undulatory bedding, highly weathered in upper 2½'.	a) N67W 17N B b) N05E 56S JS

Dry Density (pcf)	Moisture Content (%)	Sample	Depth
111.2	11.6	●	4'
	10.1	■	7'

GRAPHIC REPRESENTATION SCALE: 1"= 4' (H:V)



AAKO GEOTECHNICAL ENGINEERING

TRENCH LOG NO. T-4

Job No.: 8518-G1-A9

Logged By: J.S. Orientation: N46E Elev.: Date: 6/5/89

Client: Orange County Broadcasting Site: Blackstar Canyon Rd., Orange Co., CA

EARTH MATERIALS

A) Slopewash - Very fine sandy clayey SILT, mottled olive gray and orange brown, moderately moist to very moist, moderately dense, rootlets throughout, scattered bedrock fragments to 1/4" in diameter.

B) Bedrock - SILTSTONE, clayey, fine sandy, medium to olive brown, moderately moist, stiff to hard, highly weathered upper 1 foot, thinly bedded, some iron oxide staining, scattered carbon deposits, dense 1' below contact, moderately well jointed, tightly jointed, scattered evaporite (calcite) deposits on bedding planes.

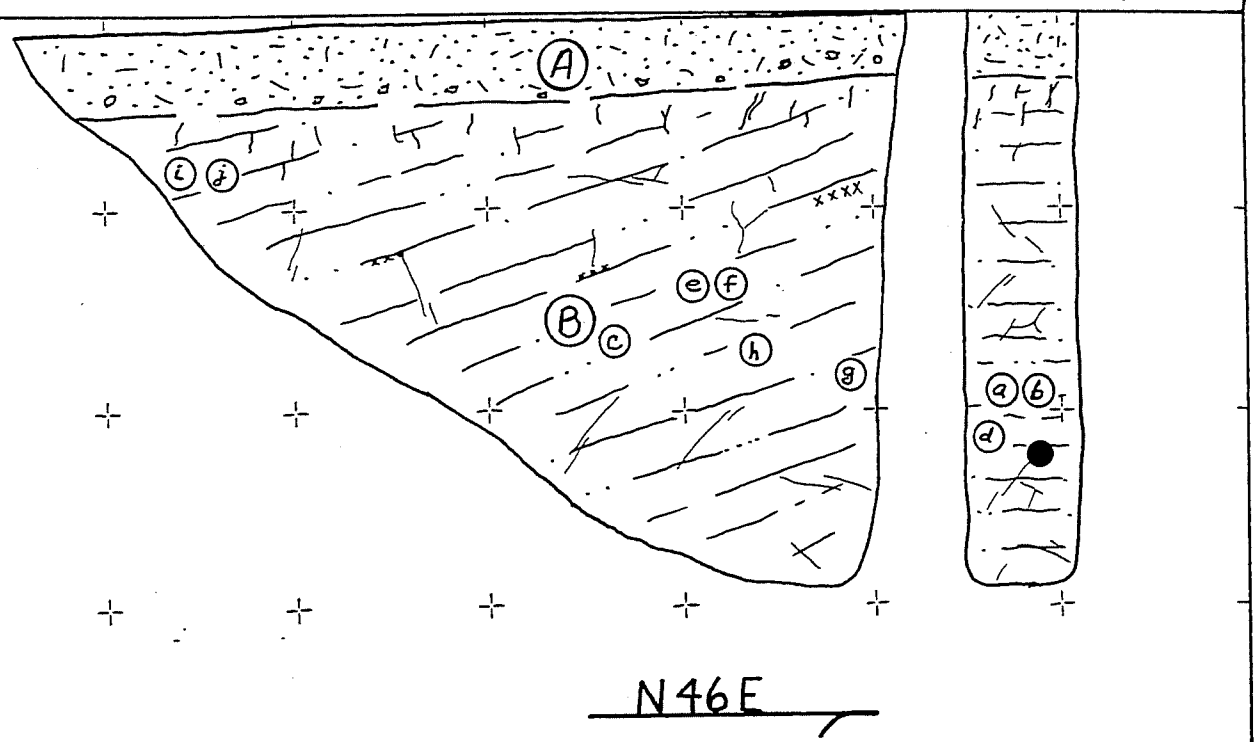
ATTITUDES

a) N-2 9W B
b) 21E 75S J
c) N25E 71E J
d) N15W 8W B
e) N32W 15W B
f) N-S 14W B
g) N26W 13W B
h) N 5W 14W B
i) N29W 14W B
j) N25W 61S JS

Dry Density (pcf)	Moisture Content (%)	Sample	Depth
	7.1	■	1'
120.8	8.6	●	2'
119.8	9.1	●	5'
	10.1	■	7'
	8.6	●	9'

GRAPHIC REPRESENTATION

SCALE: 1"= 4' (H:V)



AAKO GEOTECHNICAL ENGINEERING CONSULTANTS, INC

AGE-121

TRENCH LOG NO. T-6

Logged By: J.S. Orientation: N22W Elev.: Date: 6/5/89 Job No.: 8518-G1-A9

Client: Orange County Broadcasting Site: Blackstar Canyon Rd., Orange Co., CA.

EARTH MATERIALS

A) Slopewash - Very fine sandy clayey SILT, mottled olive gray and orange brown, moderately moist to very moist, moderately dense, rootlets throughout, scattered bedrock fragments to 1/4" in diameter.

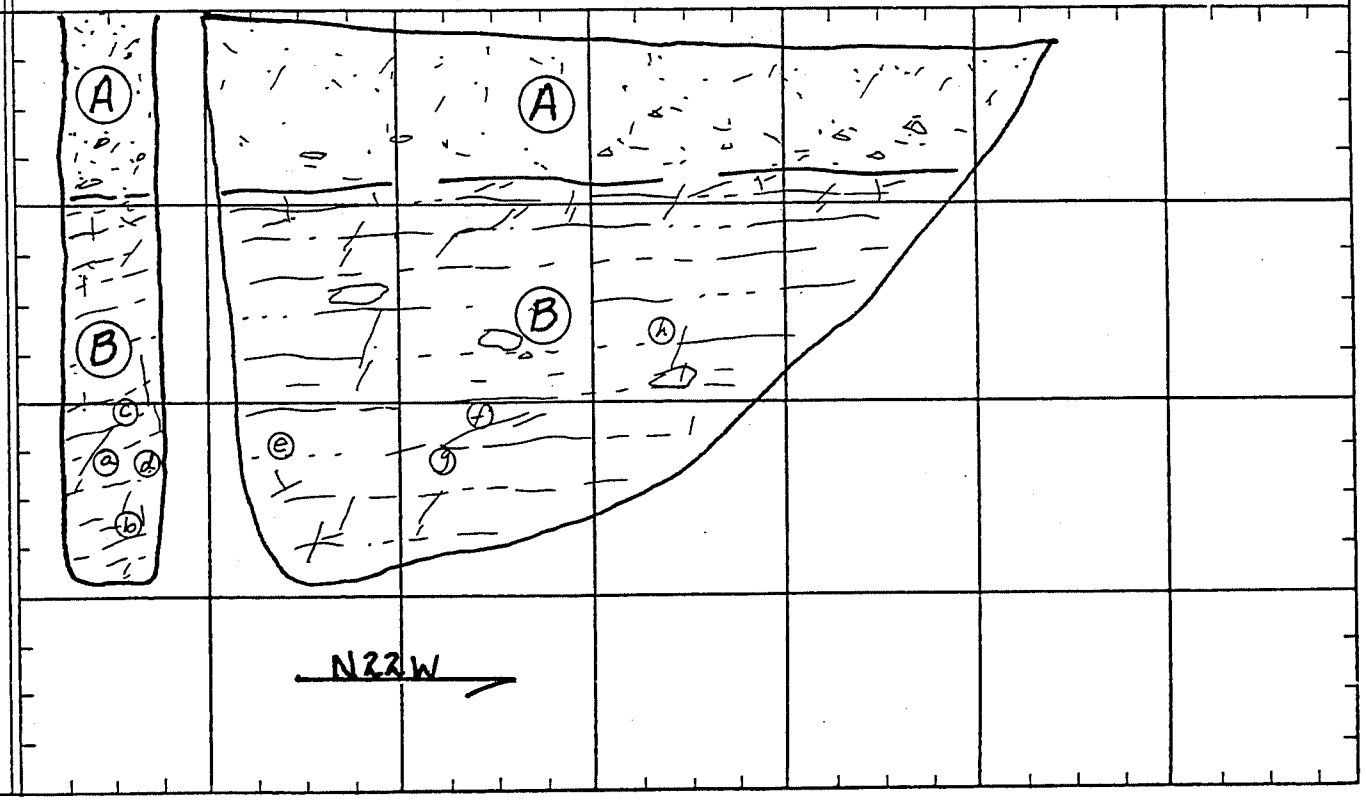
B) Bedrock - SILTSTONE, fine sandy, brown-gray to orange brown, moderately moist, stiff to hard, scattered siltstone concretions to 10" in diameter, some caliche, carbon and iron oxide staining found on bedding and joint surfaces, well jointed, tightly jointed, upper 1½' highly weathered, thinly bedded to laminated, planar to undulatory bedding, continuous.

ATTITUDES

a) N29E 28W B
b) N31E 34W B
c) E-W 40S J
d) N87W 59S J
e) N25E 23W B
f) N52E 88S J
g) N48E 29W B
h) N 2E 66S J

Dry Density (pcf)	Moisture Content (%)	Sample	Depth
106.9	12.4	●	3'
	8.5	■	5'
119.8	9.1	●	6'

GRAPHIC REPRESENTATION SCALE: 1"=4' (H:V)



AAKO GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

AGE #130 (7/87)

TRENCH LOG NO. T-8

Logged By: P.K. Orientation: N67W Elev.: Date: 6/5/89 Job No.: 8518-G1-A9

Client: Orange County Broadcasting Site: Blackstar Canyon Rd., Orange Co., CA.

EARTH MATERIALS

A) Slopewash - Fine sandy clayey SILT, brown with iron oxide staining, very moist, stiff, 5-10% void spaces, scattered rootlets to 1/8" in diameter, scattered bedrock fragments, scattered cobbles to 4" in diameter.

B) Alluvium - Fine sandy clayey SILT, brown to orange brown, moist to very moist, moderately dense, rootlets throughout, 10-12% open voids, iron oxide staining throughout.

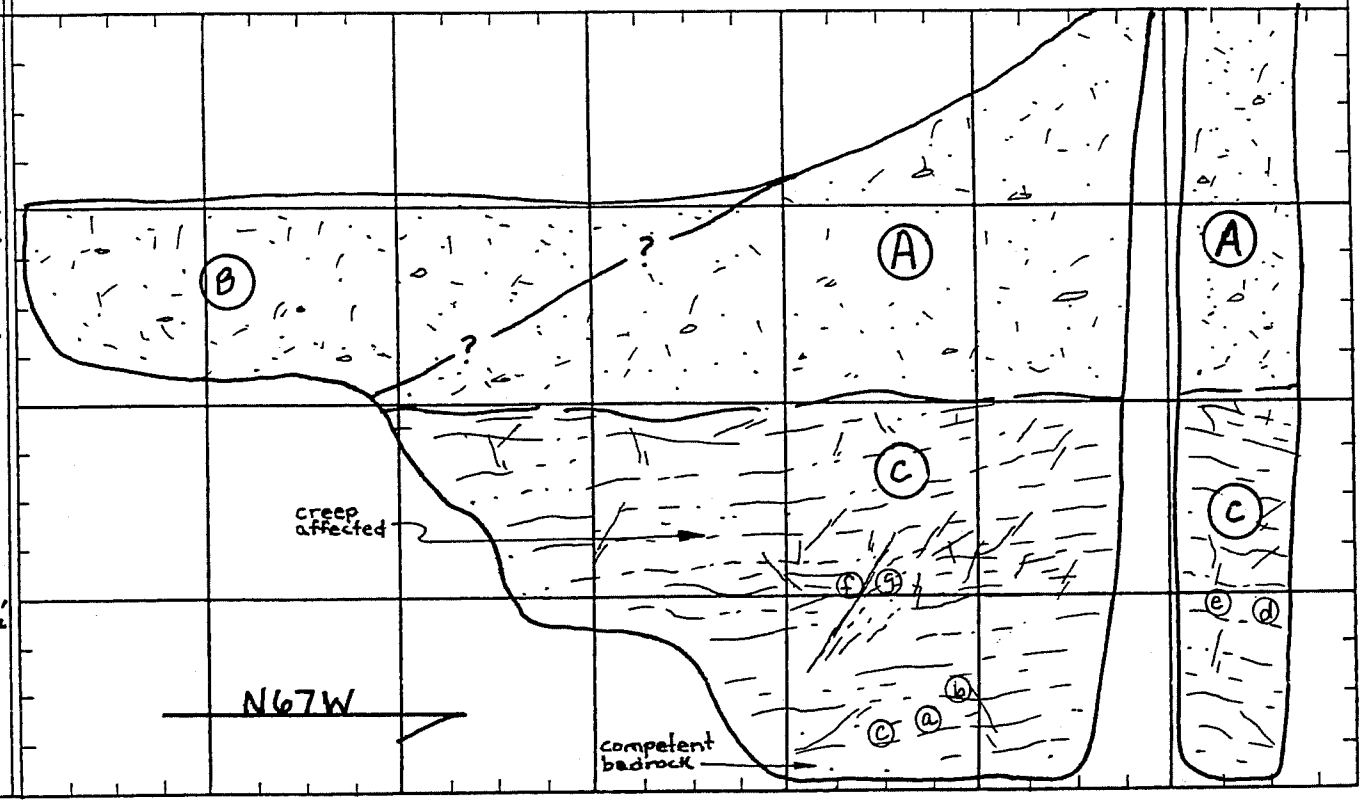
C) Bedrock - SILTSTONE, clayey very fine sandy, mottled olive brown, yellow brown, moist to locally very moist, moderately dense to dense, well jointed, slightly open to tight joints, iron oxide staining on joints, scattered carbon deposits, thinly bedded to laminated, undulatory, locally folded, highly fractured upper 4 to 5', scattered concretions, shear zone very moist to wet, bedding is highly deformed in shear zone, competent bedrock at 12½'.

ATTITUDES

a) N55W 37S B
b) 48W 80N J
c) 55W 45S B
d) 38E 41N B
e) 27W V J
f) N45E 87N F
g) N31E 40N B

Dry Density (pcf)	Moisture Content (%)	Sample	Depth
110.0	13.2	●	3½'
110.5	16.1	●	4½'
		■	6'
115.3	13.8	●	6½'
114.6	11.1	●	10'
	15.8	■	11'
	16.9	■	12½'

GRAPHIC REPRESENTATION SCALE: 1"= 4' (H:V)



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AGE #130 (7/87)

APPENDIX 'C'

LABORATORY TEST RESULTS
(3) CONSOLIDATION TESTS
(2) EXPANSION INDEX
(2) SHEAR TEST

Job#: 8518-G1-A9

DIRECT SHEAR TEST

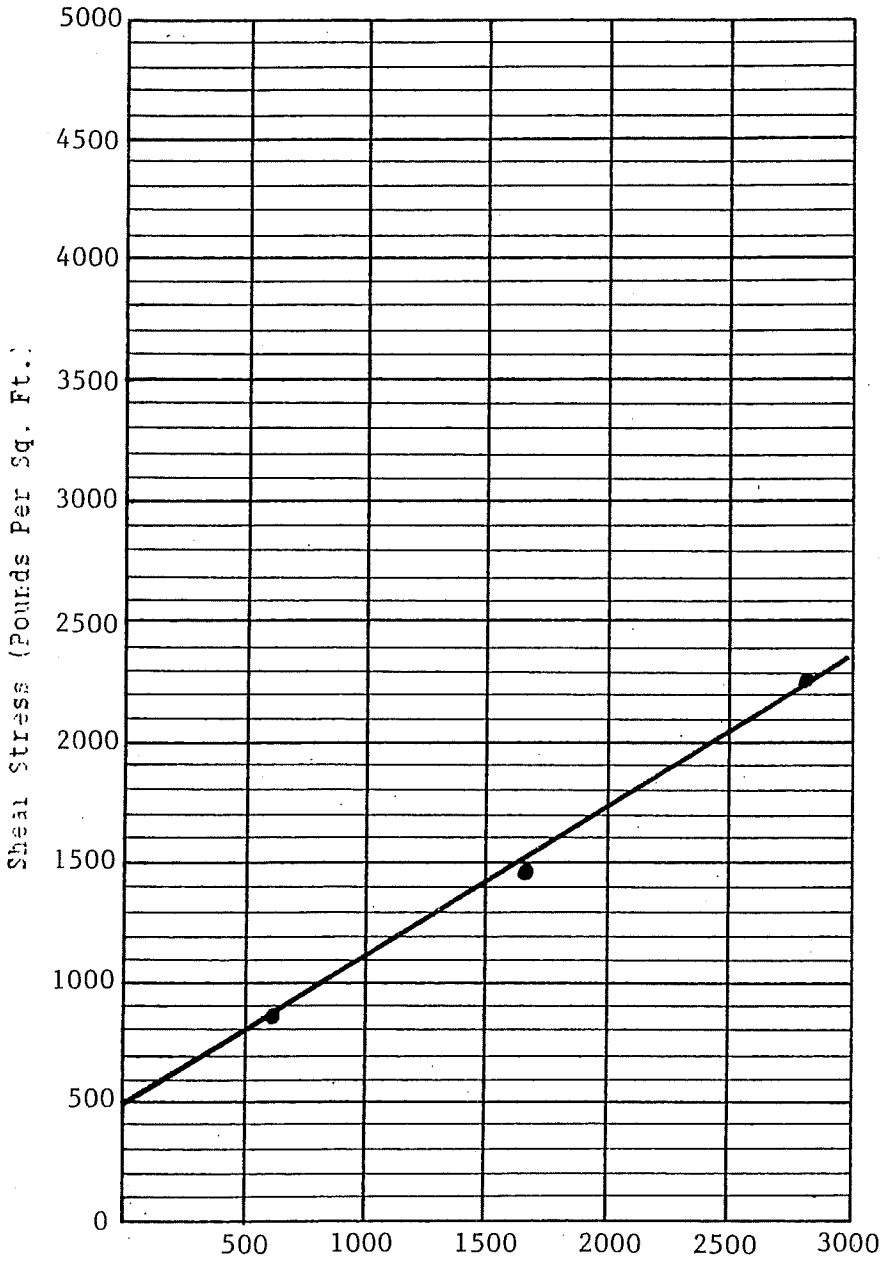
Client: Orange County Broadcasting Site: Blackstar Canyon Rd., Orange Co.,

Technician: N.O. Date: 6/12/89

Earth Material: Bedrock - SILTSTONE, Clayey, Fine Sandy.

Sample: T-4 @ 5'

Samples tested at saturated moisture condition - (Test Method: ASTM D-3080-72)



Sample:

Undisturbed: X
Remolded:

Sample Dimensions:

Diameter: 2.413"
Height: 1.0"

Initial Dry Density: 119 pcf

Moisture Content:

Initial: 9.1%
Final: 16.4%

Shear Strength:

Peak Value
Ø =
C =

Ultimate Value
Ø = 32°
C = 500 psf

Residual(Re-shear) Value:
Ø =
C =

Strain Rate:

0.05 mm / min.
inches / min.

- O Peak Value
- ● Ultimate Value
- △ Residual(Re-shear) Value

11/86 rcw

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CONSOLIDATION-PRESSURE CURVE

Project No. 8518-G1-A9

Client Orange County Broadcasting

Site Blackstar Canyon Road
Orange County, California

Technician N.O.

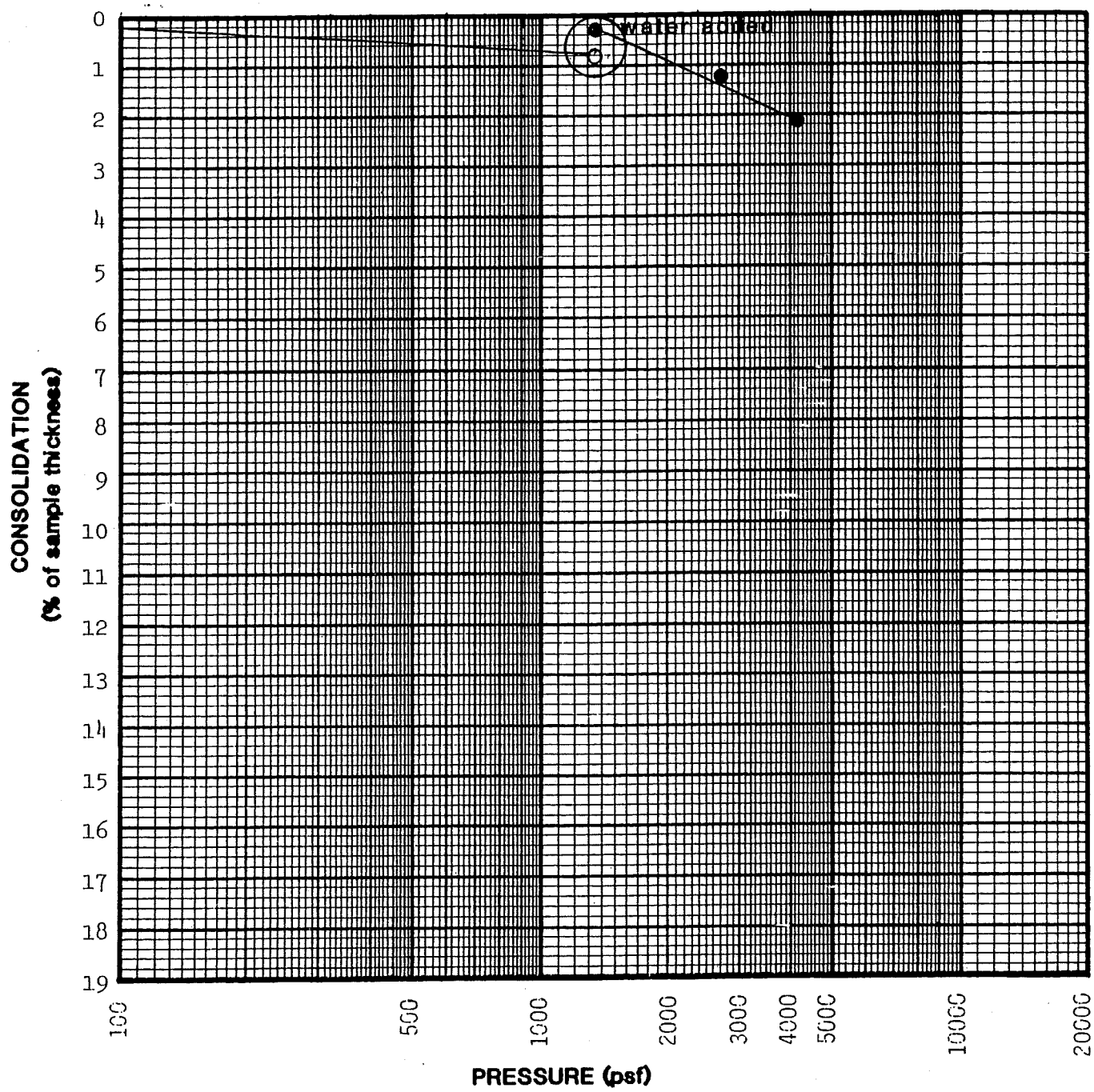
Date 6/7/89

Sample T-8

Depth 4½'

Test Specification:
ASTM D-2435-80

Earth Material Alluvium - Fine Sandy Clayey SILT.



○ Sample at Field Moisture

● Sample after Saturation

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CONSOLIDATION-PRESSURE CURVE

Project No. 8518-G1-A9

Client Orange County Broadcasting

Site Blackstar Canyon Road
Orange County, California

Technician N.O.

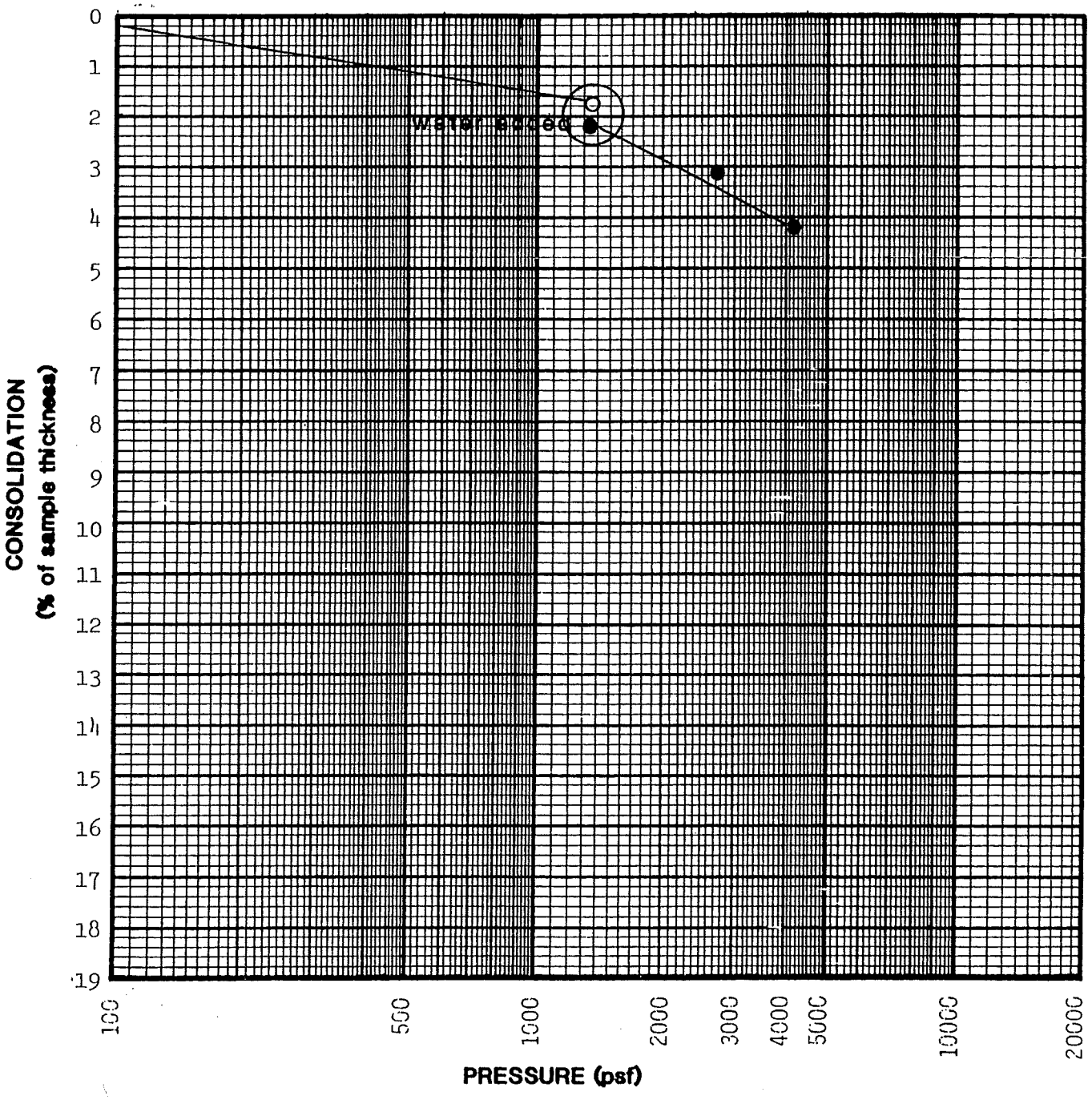
Date 6/7/89

Sample T-5

Depth 5½'

Test Specification:
ASTM D-2435-80

Earth Material Bedrock - SILTSTONE, Clayey, Fine Sandy.



○ Sample at Field Moisture

● Sample after Saturation

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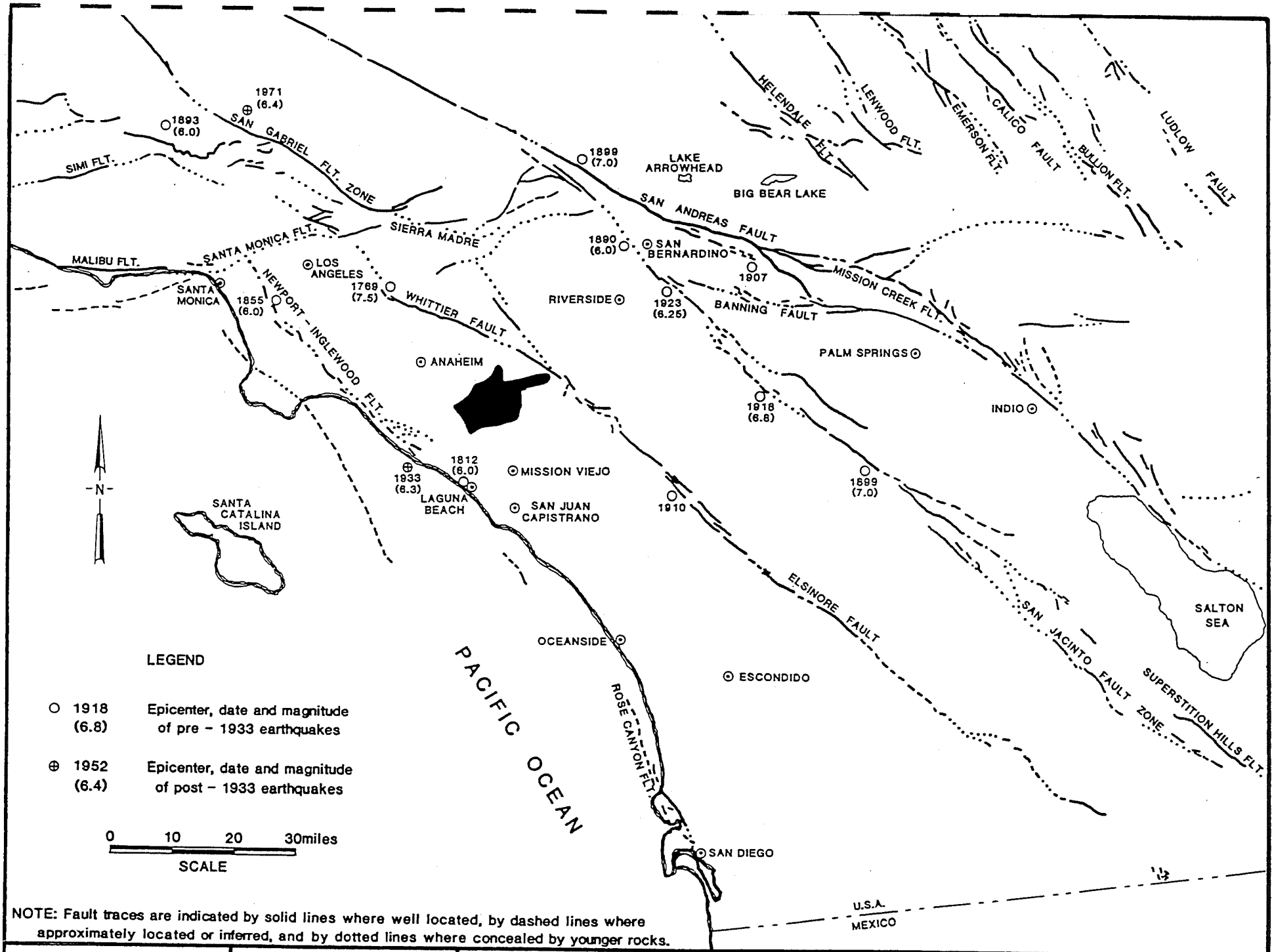

NOTE: Fault traces are indicated by solid lines where well located, by dashed lines where approximately located or inferred, and by dotted lines where concealed by younger rocks.

Job No. 8518-G1-A9 | Dwg. No. 1.

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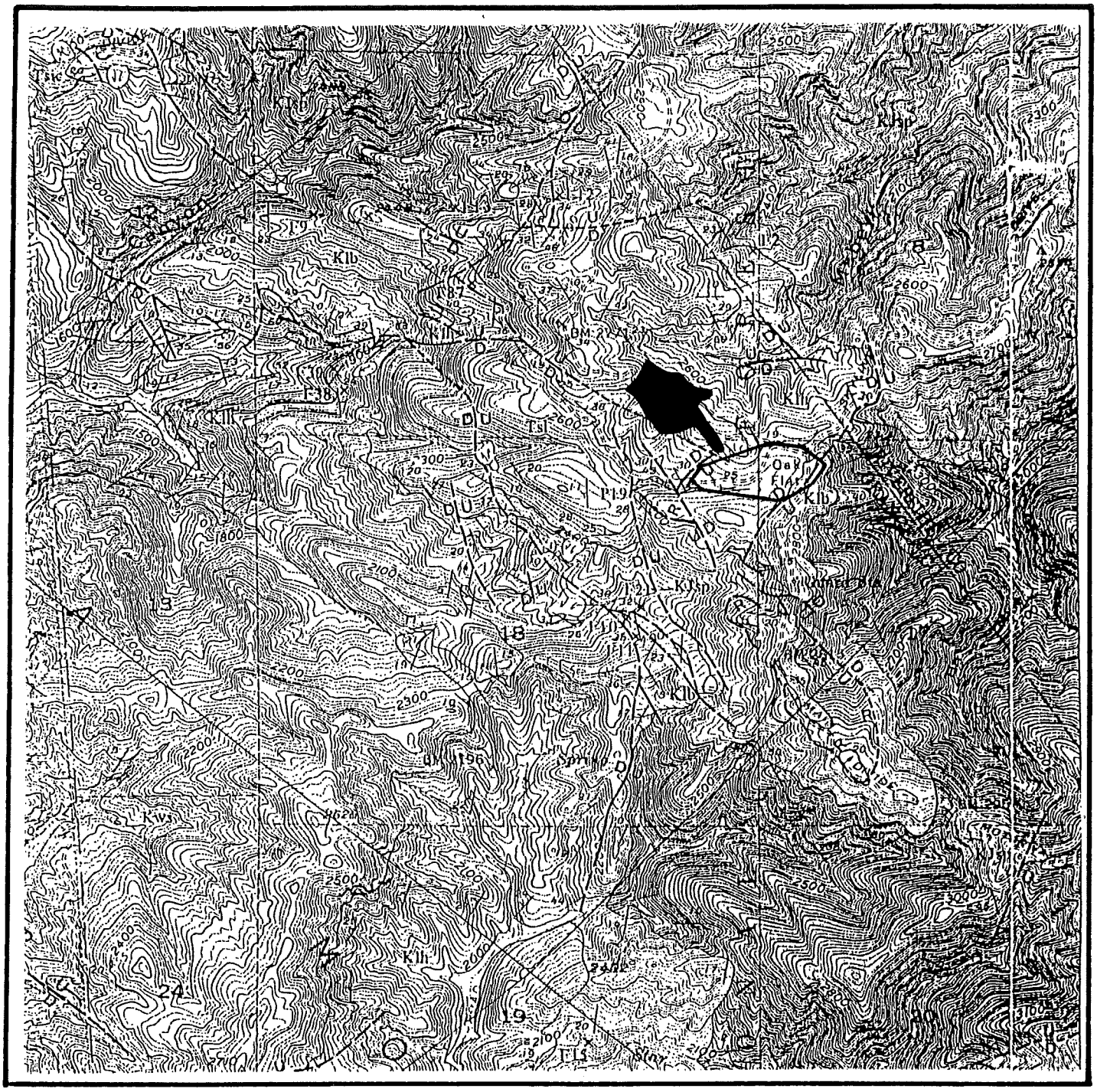
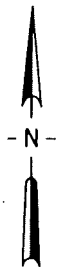
LOCATION OF MAJOR FAULTS IN SOUTHERN CALIFORNIA AND EPICENTERS OF EARTHQUAKES OF MAGNITUDE 6.0 OR GREATER

Job No. 8518-G1-A9





GEOLOGIC INDEX MAP

Scale: 1"=2000'

Reference No. 14

Drawing No. 3.

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US Soils